

CLAIMS

1. An electric double-layer capacitor comprising: a case, an element, a separator and an electrolytic solution,

the element being composed of a pair of polarizable electrodes, which are one of being wound and laminated with a separator disposed therebetween, and the element being sealed in the case with the electrolytic solution, wherein

an electrode material of the polarizable electrodes is an alloy of carbon and aluminum.

2. The electric double-layer capacitor of claim 1, wherein the alloy contains carbon and aluminum in a ratio of 3:4.

3. An electric double-layer capacitor comprising: a case, an element, a separator and an electrolytic solution,

the element being composed of a pair of polarizable electrodes, which are one of being wound and laminated with a separator disposed therebetween, and the element being sealed in the case with the electrolytic solution, wherein

the polarizable electrodes are electrode foils at least one of which is made of aluminum; and

the at least one of the electrode foils is coated on front and rear sides thereof with aluminum fluoride.

4. An electric double-layer capacitor comprising: a case, an element, a separator and an electrolytic solution,

the element being composed of a pair of polarizable electrodes, which are one of being wound and laminated with a separator disposed therebetween, and the element being sealed in the case with the electrolytic solution, wherein

the polarizable electrodes are electrode foils made of an alloy of carbon and aluminum; and

the electrode foils are coated on front and rear sides thereof with aluminum fluoride.

5. The electric double-layer capacitor of claim 3 or 4, wherein

the electrode foils have active carbon attached to surfaces thereof; and

fluorine substitutes for at least a part of hydrophilic groups of the active carbon.

6. An electric double-layer capacitor comprising: a case, an element, a separator and an electrolytic solution,

the element being composed of a pair of polarizable electrodes, which are one of being wound and laminated with a separator disposed therebetween, and the element being sealed in the case with the electrolytic solution, wherein

the case is coated on at least an inner surface thereof

with aluminum fluoride.

7. An electric double-layer capacitor comprising: a case, an element, a separator and an electrolytic solution,

the element being composed of a pair of polarizable electrodes, which are one of being wound and laminated with a separator disposed therebetween, and the element being sealed in the case with the electrolytic solution, wherein

an electrode material of the polarizable electrodes is an alloy of carbon and aluminum; and

the case is coated on at least an inner surface thereof with aluminum fluoride.

8. An electric double-layer capacitor comprising: a case, an element, a separator and an electrolytic solution,

the element being composed of a pair of polarizable electrodes, which are one of being wound and laminated with a separator disposed therebetween, and the element being sealed in the case with the electrolytic solution, wherein

the polarizable electrodes are electrode foils, at least one of which is made of aluminum;

the at least one of the electrode foils is coated on front and rear sides thereof with aluminum fluoride; and

the case is coated on at least an inner surface thereof with aluminum fluoride.

9. An electric double-layer capacitor comprising: a case, an element, a separator and an electrolytic solution,

the element being composed of a pair of polarizable electrodes, which are one of being wound and laminated with a separator disposed therebetween, and the element being sealed in the case with the electrolytic solution, wherein

the polarizable electrodes are made of an alloy of carbon and aluminum, and are coated on front and rear sides thereof with aluminum fluoride; and

the case is coated on at least an inner surface thereof with aluminum fluoride.

10. A method for manufacturing an electric double-layer capacitor comprising a case, an element, a separator and an electrolytic solution,

the element being composed of a pair of polarizable electrodes, which are one of being wound and laminated with a separator disposed therebetween, and the element being sealed in the case with the electrolytic solution, the method comprising:

applying carbon to an aluminum foil which is an electrode material; and

heating the aluminum foil with carbon applied thereto to a temperature at which the aluminum foil and the carbon are alloyed, thereby forming an alloy of carbon and aluminum onto

a surface of the electrode material.

11. A method for manufacturing an electric double-layer capacitor comprising a case, an element, a separator and an electrolytic solution,

the element being composed of a pair of polarizable electrodes, which are one of being wound and laminated with a separator disposed therebetween, and the element being sealed in the case with the electrolytic solution, the method comprising:

applying carbon to an aluminum foil which is an electrode material by one of vacuum deposition, sputtering and CVD; and

heating the aluminum foil with carbon applied thereto to a temperature at which the aluminum foil and the carbon are alloyed, thereby forming an alloy of carbon and aluminum onto a surface of the electrode material.

12. A method for manufacturing an electric double-layer capacitor comprising a case, an element, a separator and an electrolytic solution,

the element being composed of a pair of polarizable electrodes, which are one of being wound and laminated with a separator disposed therebetween, and the element being sealed in the case with the electrolytic solution, the method comprising:

applying aluminum to a carbon foil which is an electrode material by one of vacuum deposition, sputtering and CVD; and

heating the carbon foil with aluminum applied thereto to a temperature at which the carbon foil and the aluminum are alloyed, thereby forming an alloy of carbon and aluminum onto a surface of the electrode material.

13. The method for manufacturing an electric double-layer capacitor of one of claims 10 to 12, wherein

the alloy contains carbon and aluminum in a ratio of 3:4.

14. The method for manufacturing the electric double-layer capacitor of one of claims 3 and 4, the method comprising:

applying a plasma treatment to the front and rear sides of the electrode foils made of aluminum so as to coat the electrode foils with aluminum fluoride.

15. The method for manufacturing the electric double-layer capacitor of one of claims 6 to 9, the method comprising:

applying a plasma treatment to the at least inner surface of the case so as to coat the case with aluminum fluoride.

16. The method for manufacturing the electric double-layer capacitor of one of claims 6 to 9, the method comprising:

forming the case using aluminum, filling the case with

a fluorine-containing solution, providing an electrode in the case, and applying a direct current between the case and the electrode so as to form an aluminum fluoride layer on an inner surface of the case.

17. An electronic device comprising:

a motor having a current supply path; and
the electric double-layer capacitor of one of claims 1 to 4 and 6 to 9 disposed on the current supply path.

18. The electric double-layer capacitor of claim 17 comprising:

a plurality of electric double-layer capacitors connected to each other one of in parallel and in series.

19. An electronic device comprising:

a motor;
a fuel cell; and
the electric double-layer capacitor of one of claims 1 to 4 and 6 to 9 disposed on a current supply path connecting the motor and the fuel cell.

20. The electronic device of claim 19 comprising:

a plurality of electric double-layer capacitors connected to each other in series.